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Round 5 grant offers, EIS Co-funded Exploration Drilling

The Government's support of exploration in underexplored areas is continuing with the release recently of successful applicants in Round 5 of the State Government's Co-funded Exploration Drilling Program.

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ROYALTIES FOR REGIONS
EXPLORATION INCENTIVE SCHEME

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5 Anglo American Exploration (Australia) Pty Ltd
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7 Antipa Minerals
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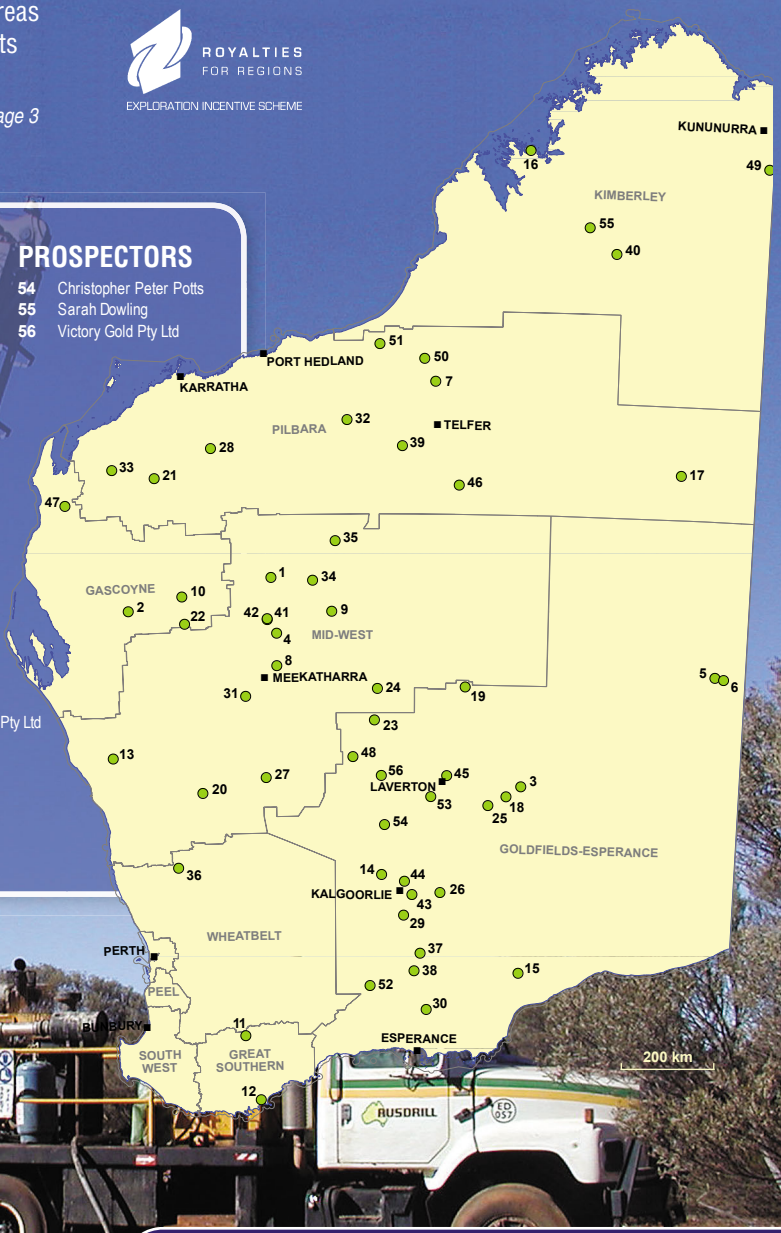

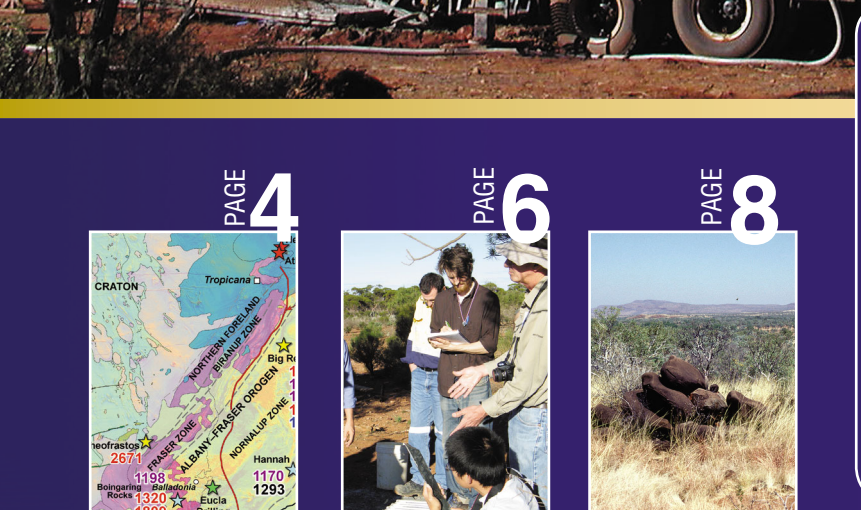

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West Musgrave Province digital package 'explained'

The 2012 West Musgrave digital package is the first product in GSWA's 1:100 000 Geological Information Series (GIS) that can generate explanatory notes on the fly for geological units covered by the package. The GeoMap.WA viewing software currently provided with all GSWA GIS products has been enhanced to allow spatial- and text-based queries of geological units on all polygon and line layers.

Spatial queries are based on selecting a unit or an area of the map display. They return links to customized explanatory notes for the selected lithostratigraphic units that have been reviewed and edited. As well as spatial queries, a dedicated button at the end of the GeoMap.WA toolbar (Fig. 1, inset a) starts text-based queries of the Explanatory Notes database. Searches for unit names or codes indicate which units are contained in the package, and to which of the layers they belong (Fig. 1, inset b). Advanced search capabilities allow filtering based on geological ages and rock type/lithology. Users can zoom or pan to one or more of the units returned by the search by highlighting them, provided they are in the active layer.

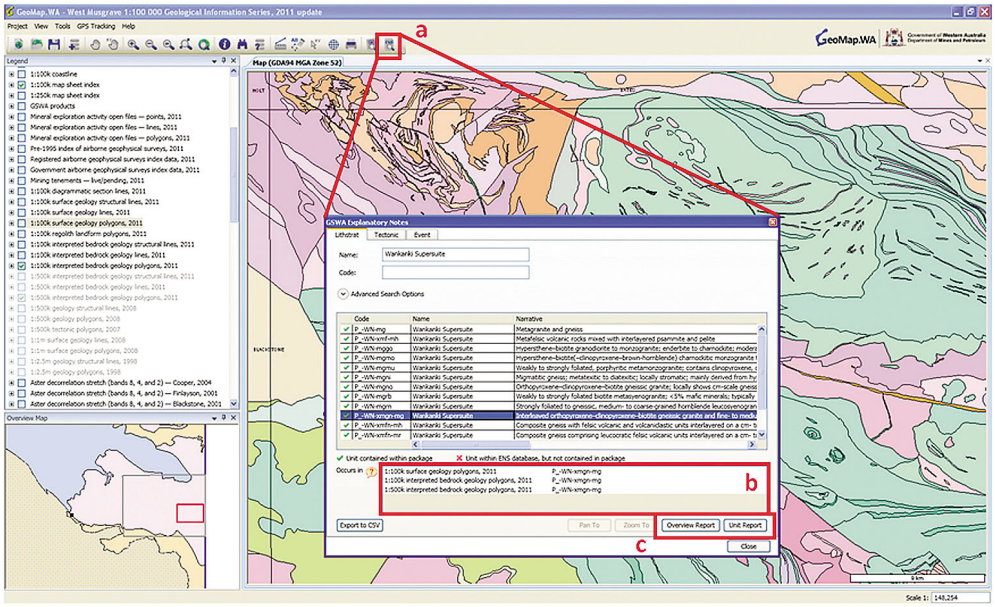

Figure 1. Layout for Explanatory Notes textual searches in GeoMap.WA

Figure 2. Table of contents for the Explanatory Notes Overview Report generated for Pitjantjatjara Supersuite 2 lithostratigraphic units

Two types of reports can be generated through textual searches (Fig. 1, inset c):

The 'Unit Report' button generates a customized report for a unit selected from the search returns. This report contains information about the distribution, lithology, lithostratigraphy, and geochronological details for the selected unit. The report also provides references with hyperlinks to PDFs of published GSWA products that are included in the package.

The 'Overview Report' option, if one or more units are highlighted, generates a Table of Contents and a series of geologically sorted reports for all units stratigraphically linked to those selected. For example, selecting any of the units named 'Pitjantjatjara Supersuite 2' generates a set of explanatory notes starting with the parent supersuite unit, followed by all its sub-units (e.g. children, grandchildren, great-grandchildren; Fig. 2).

Hyperlinks in the reports allow easy navigation to linked units (e.g. parent, grandparents, linked tectonic units, etc.).

Customized geological reports generated on the fly, are a break from the tradition followed by most Geological Surveys, including GSWA, of publishing individual explanatory notes for individual geological map sheets. Digital, data-driven explanatory notes such as those in the 2012 West Musgrave GIS package should allow updating of geoscientific information and interpretation as new data become available (e.g. new geochronology, new geophysics). The result is ongoing, and provides up-to-date information and interpretation in each update of a GIS package, relevant to an entire tectonic unit rather than a static document covering a single map sheet.

For more information, contact Angela Riganti (angela.riganti@dmp.wa.go.au) or Darren Wallace (darren.wallace@dmp.wa.gov.au).

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Successful applicants in Round 5

Over $6.2 million of co-funding was offered to 56 drilling projects, including three from prospectors.

The successful projects will be drilling for a wide spectrum of commodities, including geothermal resources.

The Co-funded Drilling Program is the flagship program of the Government's Exploration Incentive Scheme (EIS). Funding for this successful scheme, which has seen an increase in Western Australia's ranking as a destination of choice for explorers as measured by the world renowned Fraser Institute Survey, has been extended until July 2016.

In total, the government is providing $138.1 million to the EIS from 2008–09 to 2015–16.

The Co-funded Drilling program, which is receiving $45.7 million of these funds, provides incentives to drill in underexplored areas as the key to the continued economic prosperity for the State's resources industry — by helping to find the mines of tomorrow, today.

This highly competitive program, which offers two rounds of co-funding a year, has already shown success, promising both commercial and scientifically interesting projects. The successes include support for deep drilling, which led to the re-opening of the Mt Magnet gold mine. Other successes include support for

drilling instrumental in the discovery of the East Tropicana gold deposit, the Speewah vanadium deposit, the Yeneena copper discovery, and the Theseus uranium deposit.

Round 6 applications will open in September 2012 for drilling projects to be undertaken in January to December 2013.

Information acquired by the companies is publically released on the Department of Mines and Petroleum website after a short confidentiality period, adding to the geological knowledge of the State and reducing the risk for subsequent explorers.

More information about the Co-funded Drilling Program is available at <www.dmp.wa.gov.au/eisdrilling>.

2012
PETROLEUM AND GEOTHERMAL OPEN DAY

Esplanade Hotel Fremantle
Cnr Marine Tce & Essex St, Fremantle

Immediately following the
GOOD OIL CONFERENCE

Thursday
6 September 2012
8.30 am – 4.30 pm
Followed by a Sundowner

This is a great opportunity to hear presentations and view posters showing the recent activities and information relevant to the Western Australian petroleum and geothermal industries by the staff from the Department of Mines and Petroleum as well as industry leaders.

Exhibits and staff from Geoscience Australia, WA:ERA, PESA, and Australian Marine Complex will also be available.

Government of **Western Australia**
Department of **Mines and Petroleum**

REGISTER ONLINE
www.dmp.wa.gov.au/pod2012
For further information, call (08) 9222 3273

What's beneath the Eucla?

ROYALTIES FOR REGIONS
EXPLORATION INCENTIVE SCHEME

New U–Pb geochronology of the Eucla basement

Exploration of the eastern Albany–Fraser Orogen is progressing beneath the Eucla Basin, supported by U–Pb dating and geochemistry of basement rocks in drillholes [many co-funded by the Exploration Incentive Scheme (EIS)], and the acquisition and interpretation of new aeromagnetic, gravity, and seismic data.

Paragneiss in the eastern Nornalup Zone yields a maximum depositional age of c. 1730 Ma, and contains mainly Archean and Paleoproterozoic detritus. This suggests that the Paleoproterozoic Barren Basin extended east of the Fraser Zone. The Barren Basin includes the Mount Barren Group and Stirling Range, Woodline, and Fly Dam Formations deposited on the Yilgarn Craton margin. Magmatic rocks of Paleoproterozoic age and of the c. 1300 Ma Recherche Supersuite have also been dated in samples from the eastern Nornalup Zone. Several results indicate that high-temperature metamorphism and magmatism occurred in the eastern Albany–Fraser Orogen at 1190–1180 Ma (Stage II of the Albany–Fraser Orogeny).

Farther east, results from the Madura Province indicate high-grade metamorphism at c. 1480 Ma and granitic magmatism at c. 1410 Ma. Zircons of these ages are rare in the Albany–Fraser Orogen, and have been observed only in sedimentary detritus from the Fraser Zone and the eastern Nornalup Zone. More details of the samples and their geochronology are provided below.

Eastern Nornalup Zone

Big Red prospect

Big Red was drilled by Teck Australia Pty Ltd, co-funded through the EIS, to test aeromagnetic and gravity anomalies interpreted to represent a metasedimentary sequence (potentially BIF), possibly associated with IOCG mineralization. Two holes intersected basement just below 100 m, revealing interlayered granitic gneiss, metasedimentary gneiss, and amphibolite.

- Migmatitic gneiss containing Archean and Paleoproterozoic detrital zircons suggests that the Barren Basin extended further east than previously thought; maximum depositional age = 1729 ± 27 Ma
- Migmatitic granite gneiss dated at 1326 ± 6 Ma (Recherche Supersuite); high-temperature metamorphism at 1190–1180 Ma
- Esperance Supersuite granite intruded at 1167 ± 2 Ma.

Hannah project

The Hannah project lies within strongly deformed rocks of the Rodona Shear Zone, within the eastern Nornalup Zone of the Albany–Fraser Orogen. Buffalo Gold Ltd drilled a single, vertical diamond hole (Hannah 1) to target a magnetic high interpreted to be of mafic–ultramafic composition, with potential for Ni–Cu–PGE mineralization. At 420 m, the hole intersected foliated metagabbro, which yielded a metamorphic age of 1170 ± 4 Ma, and a single inherited zircon at c. 1293 Ma (?Recherche Supersuite).

Southeast of Boingaring Rocks

Surface exposures of migmatitic granite gneiss yielded magmatic ages of 1809 ± 8 Ma (similar to the 1806 Ma age to the west at Salmon Gums) and 1320 ± 8 Ma (Recherche Supersuite); high-temperature metamorphism occurred at 1198 Ma.

Madura Province

Burkin prospect

At Gunson Resources' Burkin prospect, two EIS co-funded drillholes intersected a coincident magnetic and gravity high, potentially hosting Proterozoic Ni–sulfide mineralization. The primary lithology of the basement rock is unclear, due to strong deformation, migmatization, and alteration. However, layered sequences are potentially metasedimentary rocks, possibly including BIF.

- Three zircon cores (inherited or detrital) dated at 2408–2293 Ma
- Four zircons provide a possible maximum age of deposition of 1538 ± 17 Ma
- High-temperature metamorphism (migmatization) occurred at 1478 ± 4 Ma
- Migmatization postdates folding, indicating that deformation occurred prior to c. 1478 Ma.

Loongana prospect

The Loongana prospect was drilled by Helix Resources Ltd in 2003, targeting a mafic–ultramafic layered intrusion interpreted from geophysical data, with potential for Ni–Cu–PGE mineralization. Basement rocks in two vertical holes are mainly metagranite and lesser metagabbro. Four metagranite samples yield magmatic crystallization ages of 1415–1407 Ma. Dating of metagabbro is in progress.

Forrest Province

The Forrest Province is separated from the Madura Province by the Mundrabilla Shear Zone. Stratigraphic drilling will be undertaken by GSWA to determine the nature and age of this basement province.

Eucla 1

The only geochronology information comes from small rock chips recovered from the base of the Alliance Petroleum well, Eucla 1. The rock is interpreted to be a granite, consistent with the aeromagnetic pattern of a set of northeast-trending plutons. Zircons thought to be magmatic yielded a crystallization age of 1140 ± 8 Ma. A single zircon at 1598 Ma could represent a basement component of the Forrest Province.

Continuing work in the Eucla basement

- New 2.5 km grid gravity data have been released
- Planning for stratigraphic drilling of the basement is in progress
- Geochronology, whole-rock geochemistry, and isotopic analysis of current drillcore samples are continuing
- EIS co-funded core from the Haig and NSD prospects has been sampled
- Detailed geophysical interpretation is in progress, and will be released as part of an exploration package in 2012–13.

For more information, contact Catherine Spaggiari (catherine.spaggiari@dmp.wa.gov.au) or Chris Kirkland (chris.kirkland@dmp.wa.gov.au).

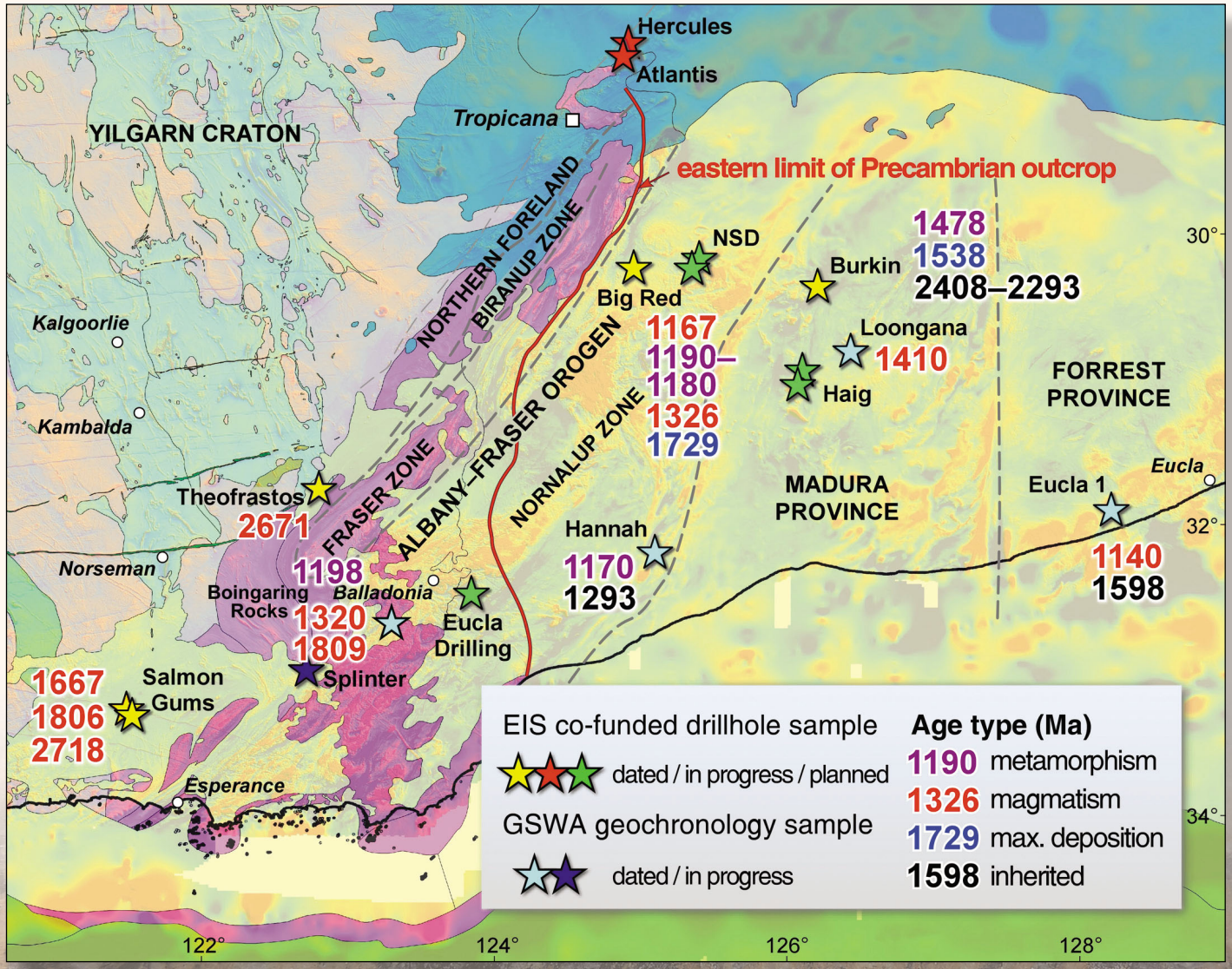


Figure 1. Prospects and drillholes sampled for geochronology in the eastern Albany–Fraser Orogen and Eucla Basin basement

Targeting the big one:

new criteria for identifying gold and base-metal deposits

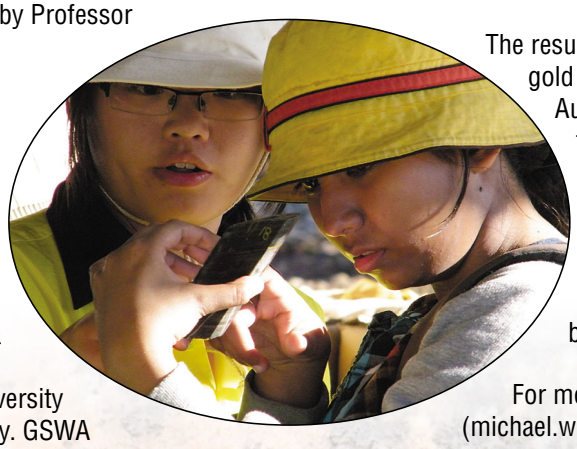
ROYALTIES FOR REGIONS
EXPLORATION INCENTIVE SCHEME

An unusually large number of gold and base-metal deposits formed on Earth between about 2.8 and 2.6 billion years ago. In recent years, the mining of these deposits has contributed billions of dollars to Western Australia's economy, and provided the financial backbone for many regional communities. However, the future of this valuable industry is threatened by a prolonged decline in production levels and discoveries. A new three-year Australian Research Council (ARC) Linkage project will re-evaluate the late Archean evolution of Yilgarn Craton crust and establish new criteria for identifying hidden deposits of gold, lead, zinc, copper, and silver.

Field-based volcanological, sedimentological, and structural observations will be integrated with a suite of state-of-the-art geochemical and geochronological data to determine the prospectivity of basaltic and gabbroic rock units for major gold and base metal mineralization. This will improve our understanding of the internal geological architecture of mineral camps in six main areas: the St Ives and Agnew gold deposits in the Kalgoorlie Terrane, the Mount Monger gold deposit and Jaguar base-metal deposit in the Kurnalpi Terrane, and the Hollandaire base metal and Tuckabianna gold deposits in the northwestern Youanmi Terrane.

Figures: Rocks and discussions during the ARC Linkage project's first sponsors' meeting and field trip, Kalgoorlie area

This multi-disciplinary project is led by Professor Ray Cas (Monash) and involves key researchers from Monash University (Roberto Weinberg, Patrick Hayman), the Australian National University (Ian Campbell, Yuri Amelin), the Geological Survey of Western Australia (GSWA; Michael Wingate, Mark Pawley, Charlotte Hall, Stephen Wyche), and the Geological Survey of Canada (Wouter Bleeker), as well as six research students from Monash University and the Australian National University. GSWA is contributing expertise in U–Pb geochronology, and in the compilation and interpretation of geological data.



The results will have important implications for gold and base metal exploration in Western Australia, and for similar styles of deposits throughout the world. The ability to improve targeting for world-class deposits may attract a higher proportion of exploration expenditure to Western Australia and will benefit our mining industry, our regional communities, and be of international interest.

For more information, contact Michael Wingate (michael.wingate@dmp.wa.gov.au).

New maps cover 2815–2800 Ma mafic intrusions in the Murchison

ROYALTIES FOR REGIONS
EXPLORATION INCENTIVE SCHEME

The 2011 Murchison 1:100 000 Geological Information Series digital package included a 1:100 000 interpreted bedrock geology dataset that was extended to include the Nowthanna, Austin, and Coolmaninu map sheet areas. Coolmaninu is the first of a series of 1:100 000 map sheets that will cover the c. 2815 Ma Windimurra Igneous Complex. Two further sheets, Challa and Windimurra, covering parts of the complex have now been released and with Wynyangoo, will be included in the upcoming 2012 release of the digital package.

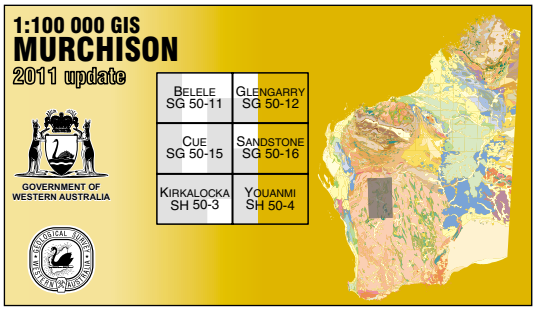
Datasets included in the digital packages are field observation sites, petrography sites and information, geochemistry sample sites and information, and geochronology sites and information. Also included are relevant GSWA publications including maps (PDFs) and the Hallberg Murchison 1989–94 geology dataset and reports (GSWA Record 2000/20), together with available geophysical imagery, mineralization and exploration information, and ASTER, Landsat TM and SPOT satellite imagery, as well as digital elevation model imagery from the Shuttle Radar Topography Mission. Information and images from the Youanmi deep seismic reflection survey, which crossed the Windimurra intrusion, will also be included in the 2012 release (see Fieldnotes 62).

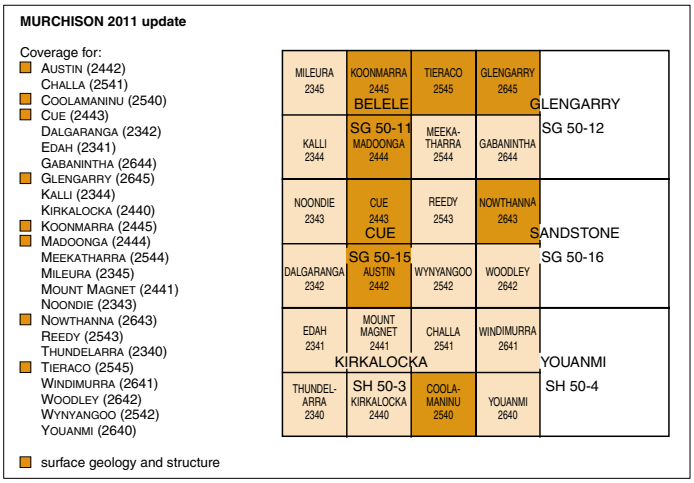
The Windimurra and Narndee Igneous Complexes are two distinctive layered mafic–ultramafic intrusions in the Murchison Domain of the Yilgarn Craton. Owing to their relatively good preservation, these complexes offer a window into the mantle during the late Mesoarchean. The complexes belong to the Meeline and Boodanoo Suites (respectively) of the c. 2815 to c. 2735 Ma Annean Supersuite. Their age and stratigraphic relationships have been poorly understood previously, but recently acquired U–Pb age data (Ivanic et al., 2010, Australian Journal of Earth Sciences, v. 57, p. 597–614) indicate a significant mafic–ultramafic event at c. 2800 Ma that was responsible for the emplacement of voluminous intrusive complexes during this chaotic and relatively short-lived event. The complexes of the Meeline and Boodanoo Suites (Fig. 2) formed as concentrically layered, inwardly dipping intrusions, now modified by strike-slip shear zones and brittle faulting. The recent seismic data reveal a broad, upward facing, conical form for the Windimurra Igneous Complex (Jones et al., 2012, ASEG Conference Brisbane, Abstracts, p. 1–4). Strong reflectors within the lower parts of the complex indicate a well-layered and thick ultramafic zone down to approximately 7 km depth.

The intrusions document the presence of coexisting hydrous and anhydrous mantle domains tapped during the late Mesoarchean. Recent geochemical and age data from the Windimurra, Youanmi, and Narndee Igneous Complexes (see Ivanic, 2012, GSWA Record 2012/2, p. 3–5) highlight the diverse mantle melts and respective sources that were emplaced within a period of only 5–10 m.y. The Windimurra Igneous Complex shows very little evidence for contamination of any kind, and appears to be depleted mantle-like. In contrast, the Narndee Igneous Complex shows evidence for derivation from LREE (light rare earth elements) - enriched hydrous mantle material, and also lacks evidence for significant crustal interaction. Hence, differing mantle domains are envisaged for these two magmas: an initial anhydrous domain tapped at c. 2810 Ma was responsible for the Windimurra Igneous Complex and other Meeline Suite igneous complexes (e.g. Youanmi, Atley, and Barrambi Igneous Complexes); and a LREE and H_2O-enriched metasomatized domain at c. 2800 Ma was the source for the Narndee Igneous Complex.

Iron–vanadium concentrations are extremely enriched in the upper zone of the Windimurra Igneous Complex; in comparison, the geochemical fractionation trend lacks significant iron enrichment at Narndee. In terms of PGE (platinum group element) content, it would be expected that Narndee harbors significant platinum; however 'U'-shaped PGE concentration patterns indicate that this magma was fractionated at depth within its feeder system. Whole-rock PGE data from the Windimurra Igneous Complex indicates that the PGE content is low on average, but has the potential for reef-like concentrations adjacent to localized zones of cumulate sulfide crystals.

For further information please contact Tim Ivanic (Tim.Ivanic@dmp.wa.gov.au) or Steve Wyche (Stephen.Wyche@dmp.wa.gov.au).





New geochronology and isotopic data constrains the tectonic setting of the Kimberley and Speewah Basins

GSWA Record 2012/7 (Constraints on the tectonic setting of the c. 1800 Ma Hart Dolerite and the Kimberley and Speewah Basins, northern Western Australia by Steve Sheppard and others) provides new geochronology and isotopic data on the Paleoproterozoic Hart Dolerite, which is part of a large igneous province comprising an estimated 250 000 km^3 of dolerite and granophyre in the Kimberley region of Western Australia. At Speewah in the East Kimberley, the Hart Dolerite is host to vanadium, titanium, iron, and fluorine mineralization.

The Hart Dolerite intruded Paleoproterozoic siliciclastic sedimentary and volcanic rocks of the Speewah Basin and overlying Kimberley Basin (Figure 1). Previously, the age of the Hart Dolerite and the ages of the dolerite's intruded successions have not been reliably established. This uncertainty has hampered interpretations of the tectonic setting of the sedimentation and magmatism. A felsic volcaniclastic rock from the middle of the Speewah Group yields a SHRIMP zircon age of 1835 ± 3 Ma, interpreted as the age of igneous crystallization, giving a maximum depositional age for the overlying Kimberley Group (Figure 2). Two samples of granophyre assigned to the Hart Dolerite, collected from localities about 250 km apart, have indistinguishable ion microprobe (SHRIMP) U–Pb zircon ages of 1795 ± 15 Ma and 1799 ± 17 Ma, providing a mean age of 1797 ± 11 Ma for crystallization of the Hart Dolerite that intrudes the lower Kimberley Group and Speewah Group (Figure 2).

Whole-rock Nd isotopic data are consistent with a common source for these granophyres and dolerites. Limited data for dolerites that intrude the upper Kimberley Group indicate that they are isotopically distinct and may not be part of the Hart Dolerite. A SHRIMP zircon crystallization age of 1740 ± 6 Ma for the Wotjulum Porphyry provides a younger limit for deposition of the upper Kimberley Group (Figure 2). These new results indicate that:

- the Speewah Group is older than granites in the Halls Creek Orogen to the east, which stitch the Kimberley Craton and the North Australian Craton
- the Hart Dolerite represents a part of the 1820–1790 Ma magmatism in the Kimberley and Tanami regions, rather than a distinctly younger event.

The Speewah Group was probably deposited in a retro-arc foreland basin behind the active eastern margin of the Kimberley Craton. The Hart Dolerite was sourced from subduction-modified mantle beneath the Kimberley Craton, and was closely related to plate reorganization in late Paleoproterozoic Australia.

For more information, contact Julie Hollis (Julie.Hollis@dmp.wa.gov.au).

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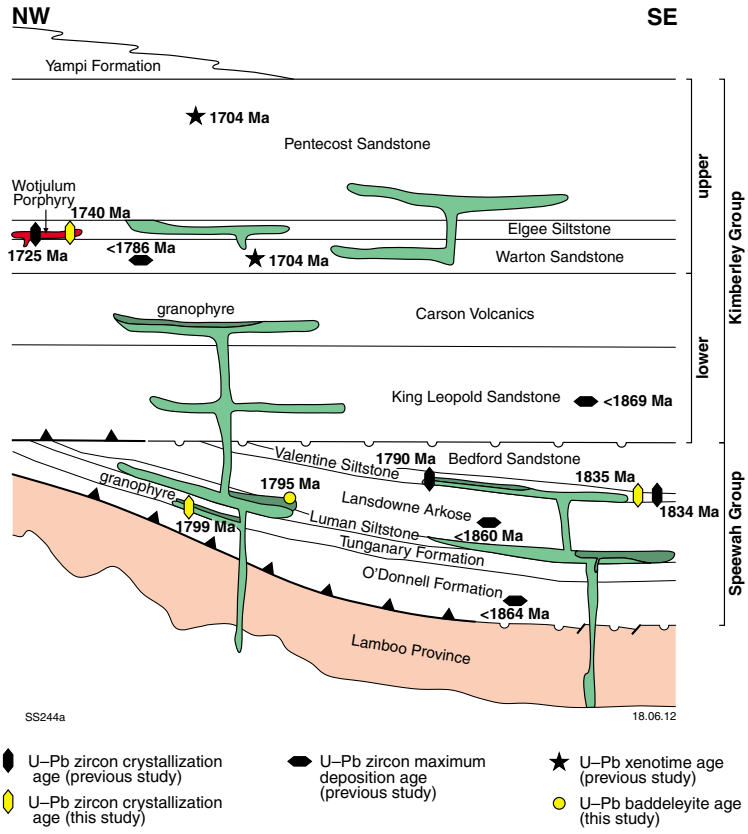

Figure 1. (above) a) Oblique aerial photograph of the Hart Dolerite intruding the Kimberley Group, Mount Ramsay 1:25 000 sheet area; b) Typical outcrop of Hart Dolerite boulders, Mount Remarkable 1:100 000 sheet area, east Kimberley

Figure 2. (below) Schematic stratigraphic and structural relationships of the Kimberley and Speewah Groups (modified from Griffin et al., 1994). Dolerite sills and dykes are shown in light green, granophyre in dark green

Paleoproterozoic crust formation in the west Musgrave Province revealed by Hf and Nd isotopes

Both the timing and mechanism of crust formation are important factors in understanding the mineral wealth of a region, as juvenile addition of material from the mantle into the crust directly or indirectly controls the mineral endowment. Studies of Hf and Nd isotopic evolution can constrain the timing of crust formation, provided that the recorded isotopic signal does not represent a mixture between materials formed at different times. Hence two caveats have been widely considered important with respect to this:

i) crust formation events can only be ascribed to periods when crystallization ages correspond to model ages

ii) trends along normal crustal evolution lines reflect reworking of the same source.

A match between model ages and the timing of reworking of evolved material implies either a real crust formation event or early source homogenization and, in either case, a coupling between lower and upper crustal processes. This is even the case where no juvenile material has been preserved from the mantle extraction event. Intracontinental rifts and other regions with sustained very-high-temperature crustal recycling processes generate magmatic provinces with extreme enrichment in high-field-strength elements (HFSE). This can have a profound influence on isotope evolution trends, suppressing typical juvenile addition patterns. Isotope mixture modelling indicates that a significant volume of mantle-derived material can be accommodated within HFSE-enriched magmas without divergence of isotopic signatures from apparent reworking trends. In order to illustrate these points, GSWA Report 115 (A multi-isotopic approach to the crustal evolution of the west Musgrave Province, central Australia by Chris Kirkland, Hugh Smithies and others) presents a case study from the west Musgrave Province in Western Australia.

The oldest exposed basement in the west Musgrave Province has been considered to be calc-alkaline igneous rocks of the 1345–1293 Ma Wankanki Supersuite, interleaved with near contemporaneous paragneisses of the Wirku Metamorphics. However, new geochronology has revealed the presence of exposed 1402 ± 4 Ma crystalline rocks. Hf isotopes in zircons from these magmatic rocks and others throughout the Musgrave Orogen indicate major juvenile crust formation events at 1950–1900 Ma and 1600–1550 Ma. Although no juvenile rocks or crystals are known from 1950 to 1900 Ma, radiogenic addition into the crust at this time is required to account for consistent Nd and Hf evolution patterns that show no indication of an initially heterogeneous source (Figure 1). Measurements of oxygen isotopes in zircons confirm that much of the Hf isotope signal is not compromised by mixtures (Figure 2). Furthermore, the correspondence between mantle extraction ages and the commencement of reworking of Archean material is consistent with generation of new crust at 1950–1900 Ma. This timing of juvenile addition is dissimilar to that observed in the Albany–Fraser and Arunta Orogens and may reflect continental arc development on the margin of a continent to the south. The general Hf isotopic evolution trend apparently reflects reworking from a dominant 1950–1900 Ma source with only minor unradiogenic and radiogenic input after that time (Figure 3). However, the Musgrave Province crust had become so HFSE enriched during the prolonged intracontinental Musgrave Orogeny (1220–1150 Ma) that it was insensitive to mantle input, which is estimated to have been 60–85% during this event.

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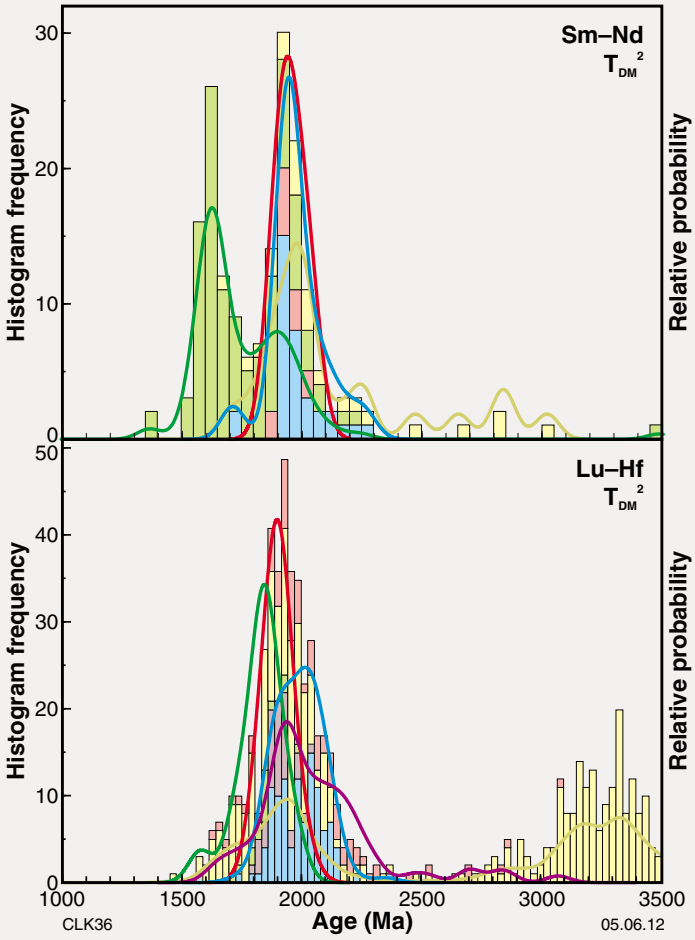


Figure 1. Probability density diagram of two-stage model ages from the west Musgrave Province. a) Whole-rock Sm–Nd, b) zircon Lu–Hf. Blue = Pitjantjatjara Supersuite, red = Wankanki Supersuite, green = Warakurna Supersuite, yellow = Wirku Metamorphics, purple = Papulankutja Supersuite

For more information, contact Chris Kirkland (Chris.Kirkland@dmp.wa.gov.au) or Hugh Smithies(Hugh.Smithies@dmp.wa.gov.au).

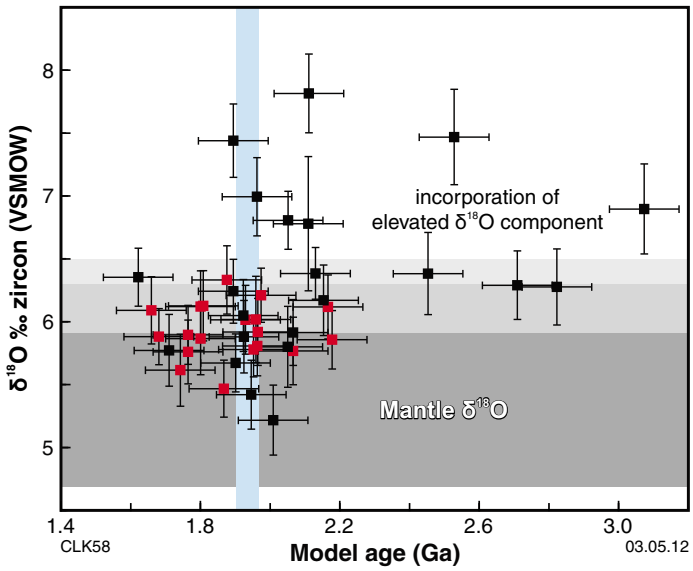


Figure 2. Zircon $\delta_{18}O_{VSMOW}$ against Hf crustal model age (Ga) from the same zircon grains. Blue vertical bar indicates the timing of hypothesized crust-formation event. Grey horizontal bars indicate values for zircons with minimal (<6.3‰) and no influence of crustal material. Note divergence to heavy oxygen values for model ages >1950 Ma. Red squares indicate data from sample GSWA 194764, black squares indicate data from sample GSWA 194765

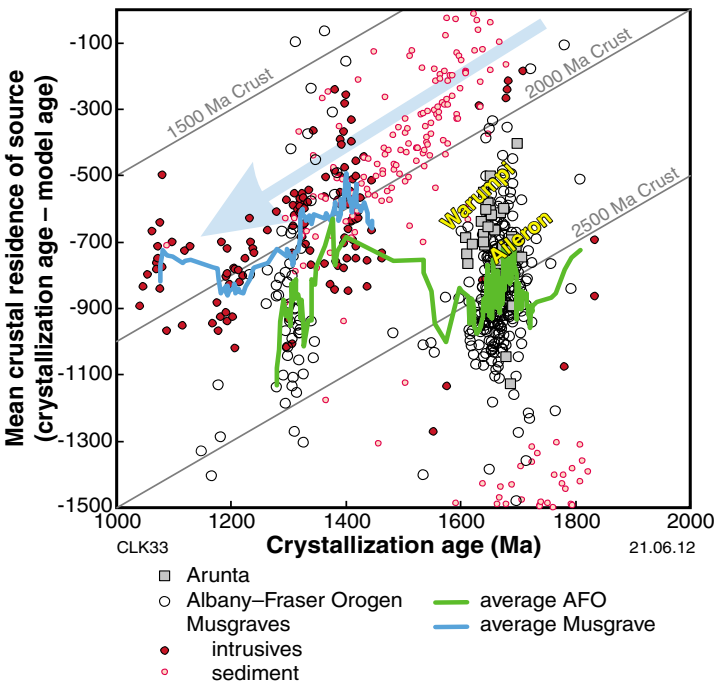


Figure 3. Event signature diagram showing the general trend of reworking (downwards), mixing (horizontal), or juvenile input (upwards). Note the indication of mantle extraction at 1950–1900 Ma in the Musgrave Province, which is dissimilar to events in the Albany–Fraser Orogen (AFO) and the Warumpi Province of the west Arunta Orogen. Blue curve indicates the best-fit average of west Musgrave Hf in zircons from magmatic supersuites; green curve indicates the best-fit average of Hf isotopes in zircons from the AFO; blue arrow indicates predominant 1900 Ma crustal reworking

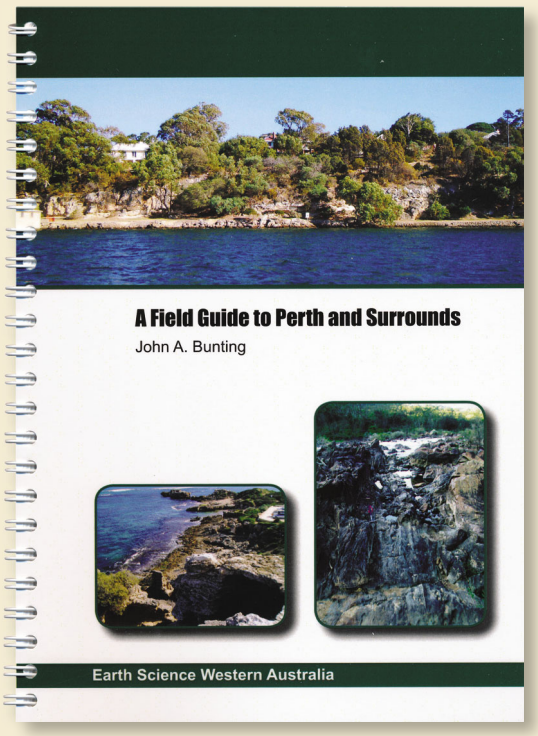
New field guide just released

A Field Guide to Perth and Surrounds by John A Bunting is an excellent new resource compiled to support the teaching of Earth and Environmental Science in Western Australian schools.

The guide covers six geologically significant sites in and around Perth, chosen for their ease of access, parking, safety, and abundance of quality outcrops. The locations cover all three rock types, climate change, structural geology, mining in Western Australia, and the environment.

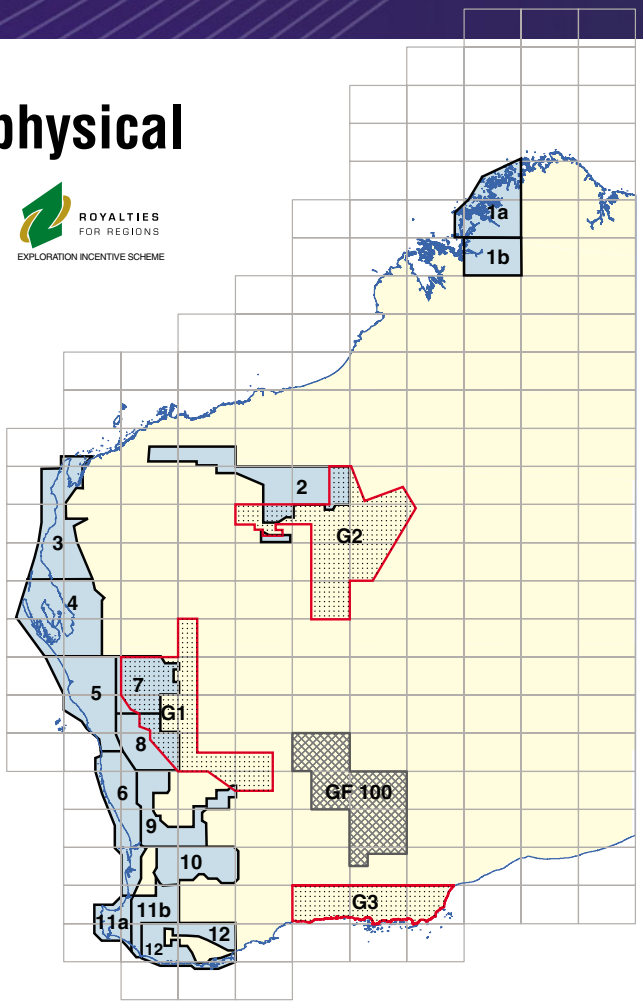
The guide consists of 111 A5 pages, printed in full colour with colour-coded sections, and ring-bound for ease of use and durability in the field. With detailed directions, including points of the compass, the guide does better than many 4x4 guides without having to revert to GPS navigation aids.

Copies of the guide can be purchased from a number of outlets, including online from the Geological Society of Australia (http://www.gsa.org.au) and the Science Teacher's Association of Western Australia (http://stawa.net). For those living in Perth, copies are available from Boffins Technical and Specialist Books, 806 Hay Street, Perth, Western Australia.



Western Australia regional geophysical surveys 2012: July update

ROYALTIES FOR REGIONS
EXPLORATION INCENTIVE SCHEME



Data access

Download final data releases from the Geoscience Australia Data Delivery System at <www.ga.gov.au/gadds>.

Download preliminary and final grids and images from the GSWA website at <www.dmp.wa.gov.au/geophysics>.

Survey outline shapefiles available online at <www.dmp.wa.gov.au/geophysics>.

Subscribe to the GSWA mailing list to keep informed of preliminary and final data release dates.

Airborne surveys 2011–12

Airborne surveys 2012–14

Gravity surveys 2012–13

For more information, contact David Howard (david.howard@dmp.wa.gov.au).

Airborne magnetic and radiometric surveys

ID	Area/Name	Line spacing and direction	Line-km	Acquisition Start	Acquisition End	Current Status	Preliminary Release[1]	Final Release
	2011–12 Program							
1a	Prince Regent – Montague Sound 2011[2]	800m; N/S	42 000	Jun-11	Dec-11	Processing	—	Sep-12*
1b	Charnley 2011	200m; N/S	102 000	Jun-11	Dec-11	Processing	9-Feb-12	Sep-12*
2	South Pilbara 2012	400 m; N/S	134 000	Jun-12*	Oct-12*	Survey 18%	—	Dec-12*
3	Carnarvon Basin North 2011	400 m; E/W	106 000	Jul-11	Oct-11	Release	—	16 Feb 12
4	Carnarvon Basin South 2012	400 m; E/W	123 000	Apr-12	Jun-12	Processing	—	Sep-12*
5	Perth Basin North 2011	400 m; E/W	96 000	Jun-11	Jan-12*	Processing	22-Feb-12	Aug-12*
6	Perth Basin South 2011	400 m; E/W	84 000	Mar-11	Mar-12	Processing	22-Feb-12	Aug-12*
7	Murgoo 2011	200 m; E/W	134 000	Mar-11	Nov-11	Processing	9-Feb-12	Aug-12*
8	Perenjori 2011	200 m; E/W	121 000	Oct-11	Jan-12*	Release	9-Feb-12	21-Jun-12
9	Moora 2011	200 m; E/W	136 000	Jun-11	Jan-12*	Release	22-Feb-12	26-Apr-12
10	Corrigin 2012	200 m; E/W	114 000	Jan-12	Mar-12	Pre-release	—	26-Jul-12*
11a	Cape Leeuwin 2011	400 m; E/W	52 000	Mar-11	Jan-12	Processing	22-Feb-12	Sep-12*
11b	Collie 2011	200 m; E/W	53 000	Mar-11	Jan-12	Processing	22-Feb-12	Sep-12*
12	Mt Barker 2011	200 m; N/S	123 000	Apr-11	Sep-12*	Survey 50%	24-May-12	Dec-12*
	2012–13 Program							
GF100	Goldfields	100 m E-W	720 000	TBD	TBD	Quotation		

Ground gravity surveys

ID	Area/Name	Station spacing	Stations	Acquisition Start	Acquisition End	Current Status	Preliminary Release	Final Release
G1	West Murchison 2012	2.5 km grid	11 900	Aug-12*	Oct-12*	Contract	—	Dec-12*
G2	East Officer	2.5 km grid	13 600	TBD	TBD	Proposal		
G3	Esperance	2.5 km grid	7 000	TBD	TBD	Proposal		

Notes

* Asterisk indicates an estimated date based on delivery information currently available. Subscribe to the newsletter for release alerts.

1. Preliminary releases are made on a case-by-case basis and consist of ecw images and ER Mapper grids of partially processed and unchecked data.
2. Prince Regent – Montague Sound 2011 flown at 800 m offset by 400 m from existing 800 m survey (P614). Data from both surveys will be integrated to produce a single 400 m dataset.

Information current at: 3 July 2012

Release Pre-release Proposal

Product releases

Any prices include GST

ISSN 1325-9377 ISBN (PRINT) 978-1-74168-460-5
ISSN 1834-2272 ISBN (PDF) 978-1-74168-459-9

REPORTS

Report 115 A multi-isotopic approach to the crustal evolution of the west Musgrave Province, central Australia
by Kirkland, CL, Smithies, RH, Woodhouse, A, Howard, H, Wilson, AC, Belousova, EA, Cliff, JB, Murphy, R, and Spaggiari, C

Report 116 Provenance of the 1340–1270 Ma Ramarama Basin in the west Musgrave Province, central Australia
by Evins, PM, Kirkland CL, Wingate, MTD, Smithies, RH, Howard, HM, and Bodorkos, S

RECORDS

Record 2011/25 Capricorn Orogen seismic and magnetotelluric (MT) workshop 2011: extended abstracts
by Johnson, SP, Thorne, AM, and Tyler, IM

Record 2011/23 The geology of the east Albany–Fraser Orogen — a field guide
by CV Spaggiari, CL Kirkland, MJ Pawley, RH Smithies, MTD Wingate, MG Doyle, TG Blenkinsop, C Clark, CW Oorschot, LJ Fox, and J Savage

Record 2012/7 Geochronological and isotopic constraints on the tectonic setting of the c. 1800 Ma Hart Dolerite and the Kimberley and Speewah Basins, northern Western Australia
by Sheppard, S, Page, RW, Griffin, TJ, Rasmussen, B, Fletcher, IR, Tyler, IM, Kirkland, CL, Wingate, MTD, Hollis, JA, and Thorne, AM

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Ledge Point – Gingin — Regionally significant basic raw materials
Perth–Woorooloo — Regionally significant basic raw materials
by Strickland, C

NON-SERIES MAPS

Iron ore deposits of the Yilgarn Craton, 2012

Plate 1 Interpreted Pre-Mesozoic bedrock geology of the east Albany–Fraser Orogen and southeast Yilgarn Craton
(accompanies Record 2011/23)
by Spaggiari, C and Pawley, M

Plate 1A Geophysical and remote sensing imagery and reference for Plate 1, east Albany–Fraser Orogen and southeast Yilgarn Craton
(accompanies Record 2011/23)
by Spaggiari, C and Pawley, M

Plate 2 Interpreted Pre-Mesozoic bedrock geology of the Tropicana region of the east Albany–Fraser Orogen
(accompanies Record 2011/23)
by Spaggiari, C and Pawley, M

GEOLOGICAL INFORMATION PACKAGES 1:100 000

Kimberley GIS update 2012
by Hollis, J and Eacott, GR

West Musgrave GIS update 2012
by Smithies, RH

NON-SERIES DIGITAL PRODUCTS

Compilation of geochronology information, 2012

DATA PACKAGES

1:250 000 digital data package – Regolith and ASTER maps of Western Australia 2012

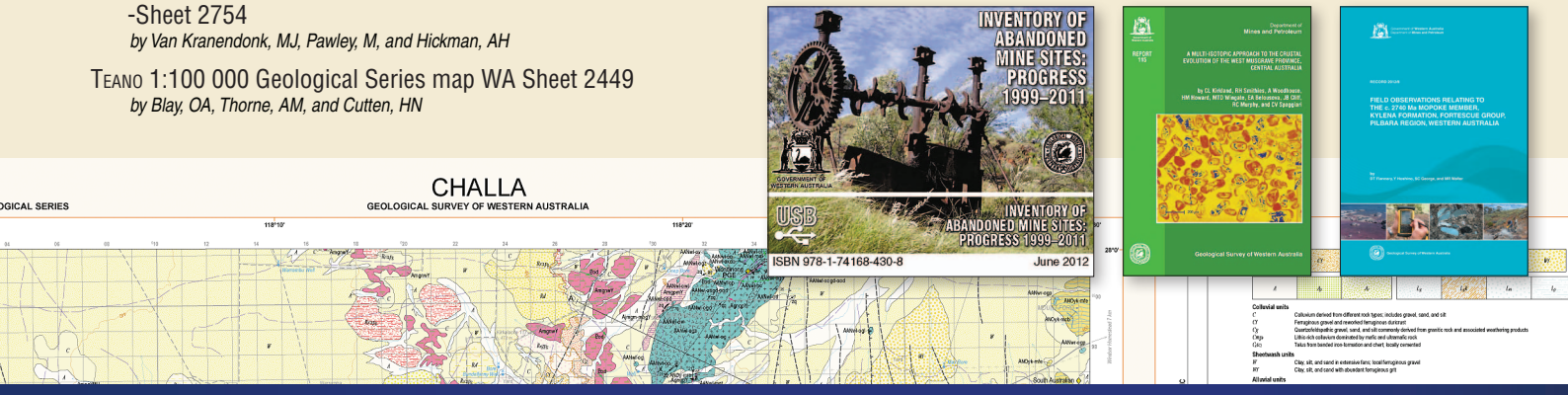
WA Coast — Gascoyne
by Gozzard, JR

WA Coast — Pilbara
by Gozzard, JR

Inventory of abandoned mine sites: progress 1999–2011

Regolith geochemistry of WA (1:250:000)

Digital data packages are available on USB for $55 (inc. GST). All other products are free to download as PDFs.



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